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ABSTRACT

Experimental instructional projects and educational programs generated by teachers at the Big Ten universities and the University of Chicago are described. Department-based projects include the following: introductory botany for nonscience students, University of Illinois, Urbana; futuristic and technological approaches to nonmajor biology, Ohio State University; communications--an integral component of the learning process, University of Wisconsin, Madison; chemistry resource room and help laboratory, Purdue University; the Indiana model for the science preparation of the elementary education major, Indiana University, Bloomington; evaluation of a year-long sequence of English courses emphasizing scientific writing, Michigan State University; writing to learn--faculty workshops on undergraduate writing, University of Minnesota; Center for Instructional Development in Engineering, Purdue University; and inservice education for improved student writing--the Wisconsin writing project, University of Wisconsin, Madison. Institutional support projects are as follows: a holistic approach to special academic services, Purdue University; the Indiana University Learning Skills Center--extending resources through linkages; Iowa regents universities Bachelor of Liberal Studies Degree; a program to improve the teaching of graduate assistants and other faculty, University of Illinois, Urbana; the integrated science program, Northwestern University; the rise and fall of course mart, University of Michigan; and diagnosis of instructional outcomes, University of Minnesota. A cumulative index to 16 reports in this series and an archival index of inactive projects are included. (SW)

ED216609

Development and Experiment in College Teaching

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The Committee on Institutional Cooperation (CIC) was established in 1959 by the Big Ten Universities and the University of Chicago to facilitate pooling of resources and talents on matters of mutual concern in higher education.

Foreword

These annual reports are collections of experimental instructional projects and educational programs generated by teachers at the Big Ten universities and the University of Chicago. Our purpose is to promote the exchange of information among college teachers, administrators, and educational researchers about ways to improve the conditions for learning. Most of the items report changes in a particular discipline area, but these arrangements can frequently be adapted for use in other departments and interdisciplinary programs.

The entries in Section I, Subject-Matter Area, describe department-based projects. Section II, Institutional Support, includes descriptions of institutional facilities, instructional media arrangements, and broad programs which span different disciplines. Section III is the Cumulative Index to all 16 reports. This index has been updated by deleting references to projects that are no longer active (the Archival Index lists these inactive projects).

Examination copies of earlier reports are on file in the office of each institutional representative (see p. iv), and at the CIC central office. Requests to purchase back issues should be sent to the address below. This publication is not copyrighted and teachers and administrators are encouraged to make free use of the material.

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I. Subject-Matter Area

BOTANY

Introductory Botany for Non-Science Students

Prior to 1979, the introductory botany course at the University of Illinois, Champaign-Urbana Campus, was taken simultaneously by both science majors (in botany, biology, and agriculture) and liberal arts students meeting their science requirement. The course included 2 hours of lecture, 3 hours of laboratory, and 1 hour of discussion per week. Test performances by the science and non-science students were not significantly different. The liberal arts students, however, were clearly dissatisfied with the traditional laboratory part of the course; when polled, only 29% responded favorably to their lab experiences versus 91% for the science majors.

A new course format has subsequently been developed for the liberal arts students. They continue to attend the same lectures as the science majors in order to gain exposure to basic concepts in the plant sciences. However, the lab has been replaced with one hour of project work per week together with one hour of discussion. New discussion and project materials were designed to fit the new format. The main objective was to relate the basic scientific concepts developed each week in lecture to practical situations and to societal and world issues.

During the projects the students have direct "hands-on" experience with practical aspects of plant growth and care. Emphasis is placed on understanding the scientific principles on which plant care is based. Projects include experience with the following: minerals and fertilizers, plant proteins and amino acid complementarity, seed germination, transplanting seedlings, forcing bulbs, vegetative propagation, pollination, grafting, pruning, soil testing, soil mixing, pots and drainage, lighting and watering. Lighted "grow-shelves" installed in the project room enable the students to monitor the growth and development of plants they eventually take home.

The discussions examine how the student's world and society is increasingly affected by plants and advances in the plant sciences. Topics discussed include: environmental priorities, population growth and dynamics, endangered species, basis versus applied research, regulation of science, genetic engineering, land-use policy, world food production, green revolution, and western agriculture in Third World countries.

Discussions are often based on outside readings appropriate to lay-person understanding. Discussions and projects rely heavily on audio-visual materials to help stimulate interest, introduce supplemental topics, provide "mini" self-directed lessons, and illustrate methods and concepts used in projects.

Subjective evaluation using student interviews and questionnaires indicates strong support for the new format. Enrollments by nonscience students have

increased substantially. While still being exposed to the same scientific concepts in lecture, they are now quite enthusiastic about integrating that knowledge with more practical applications in project and discussion hours.

For further information, contact Carol K. Augspurger, Department of Botany, University of Illinois, Urbana, IL 61801.

BIOLOGY

Futuristic and Technological Approaches to Non-Major Biology

In 1978 it became apparent that a single "General Biology" course was not adequate to meet the needs of all students at The Ohio State University, since several subsets of students with specific needs and interests could be identified: (1) majors in the biological sciences with career aspirations toward pre-professional school, graduate school, the allied health sciences, or employment in the natural sciences; (2) majors in other sciences who wished a rigorous exposure to biology, but for whom a comprehensively broad and deep course was not necessary; (3) honors students for whom a more independent, flexible, creative, and challenging biology exposure was not only desirable but also necessary; and (4) the non-science major, usually having little or no background or interest in biology. Since 1979, intensive development of "General Biology courses" designed for these student audiences has been underway. One of these courses, Biology 106, "Contemporary Perspectives in Biology" is described here.

Biology 106 was retitled from "General Biology" to "Contemporary Perspectives in Biology," and redefined as, "A humanistic approach to basic concepts and methodologies in biology relevant to everyday life, including environment/ecology, food/nutrition, health/disease, sex/reproduction, and others." To determine the focal themes and unit topics, students were asked what interested them in biology and what they wanted to learn from a biology course. Likewise, newspapers and periodicals were surveyed for those topics consistently receiving front page attention.

Wallace's Biology, The World of Life was selected for the course for several reasons. First, it enjoyed prior popularity and success, and is in a third edition. Second, its level is pitched at the appropriate reading and depth level for Ohio State's heterogeneous population. Third, although the table of contents appears traditional (beginning with cellular material and working toward environmental biology, using standard chapter headings), the writing style, effective use of humor, interjections of opinion clearly presented as opinion, and timely examples set it apart. Getting non-science majors to read a biology text is a tour de force, but once they do read it they should clearly enjoy the experience and want to read further.

Since Biology 106 has an associated laboratory, a lab manual was necessary. Humanistic Biology: Laboratory Experiences (Aspey, 1980) was compiled and edited in collaboration with a botany instructor and five graduate teaching associates. The input from graduate students was invaluable, illustrating how resourceful and creative graduate students can be when charged with responsibility and given flexibility. OSU-oriented cartoons were drawn by the student newspaper's cartoonist to illustrate the introductory page of each chapter, which correlated with the topic of each week. This strategy seemed to erase the alien feeling

toward laboratory manuals for the students; it had enough familiarity and humor to positively motivate the students to do the lab work.

Course Components

To provide a variety of dimensions and to utilize diverse human and technological resources, Biology 106 includes: 2 hours weekly in small recitation/discussion groups (N=25-35), 1 hour of film series weekly, and 3 hours in the Bio-Learning Center. Students begin each week by attending a 1-hour film series (part of a regular weekly series) sometimes on Monday afternoon or Tuesday morning. This film series forms an integral part of the course by introducing each week's theme in a dramatic fashion, sets the tone for the week's topic, and weaves the course themes together for continuity.

Three additional hours of actual hands-on laboratory experience can be taken during the week whenever the Bio-Learning Center is open (approximately 60 hours/week). Thus, the student is introduced to the week's topic by a dramatic (or timely, controversial, strong position point-of-view, etc.) film followed by 2 recitations and 3 hours of laboratory work dispersed throughout the week. Since only 3 hours are "fixed" schedule (films and recitation) while 3 hours are "open" schedule, flexibility is provided.

The Bio-Learning Center: A Modified AT Approach

The Ohio State University has experimented with a variety of educational technologies and modes of presentation for the different courses. The University has a large number of students for whom any one method may be preferable over another, and to some extent, students can choose which mode of presentation may be best suited to their needs. Presently Ohio State has audiotutorial (AT) instruction combined with recitations and laboratories, AT combined with computer managed instruction (CMI), and traditional lecture/laboratory approaches.

To help overcome the size and impersonality of the University for new students, the Bio-Learning Center (BLC) consists of nine independent modular-learning laboratories having a total capacity of 194 students in one-person carrels at any given time (about 3,300 students can be accomodated each quarter). Each module (a self-contained laboratory) contains approximately 22 carrels, thus maintaining a student/instructor ratio of 22:1. Additionally, each module contains a central laboratory table for special instrumentation, demonstrations, observations, and all materials needed for the week's unit of study. Each carrel is fully-equipped with the technology necessary for AT instruction in biology: a sink, a head set with remote control console to a reel-to-reel tape recorder, an individual slide projector with accompanying slides, a compound and stereo-dissecting microscopes. A master audiotape console is located in each module from which individual audiotapes can be accessed from the carrels.

The audiotapes focus on some aspect of the week's topic. Depending on the individual professor preparing the audiotapes, content can range from directions for accomplishing the laboratory exercises to a full-scale lecture illustrated with slides. Usually, however, the audiotape is a topical discussion that directs the week's study, and presents the most recent issues and information available. Tied in closely with the audiotape discussion are color Kodachrome slides. An average of 27 slides (range: 18-36) accompany each unit, and where possible, students see "the real thing."

This mode of presentation has the advantage of timeliness in that a given audiotape can be corrected or up-dated and duplicated onto the master console just several hours prior to opening the BLC. On the negative side, if a slide is added or deleted, considerable time demands are placed on the staff to change these in each carrel of all modules. Overall, the Bio-Learning Center allows individualized instruction including multisensory and multidimensional learning, where students can work independently or in small groups, self-pace themselves, and review as often as necessary in an integrated lecture/laboratory/self-learning system.

Student Evaluations

The present format and content of the humanistically-oriented general biology course reflects the results of over 1,600 student questionnaires and evaluations one year prior to implementing the revised course. Subsequently, student surveys have been given each quarter since the revised course first appeared (Autumn 1979-80), and data from these evaluations have guided continued refinement and "fine tuning" of the course materials. The overall positive, enthusiastic tone of the evaluations is encouraging, particularly in comparison to the negative responses prior to the revised course. Furthermore, results from the attitudinal survey reinforced and augmented this impression, since an overwhelming majority rated the overall course at the two most positive positions on a 7-position scale on the attitudinal evaluation.

Although the content and structure of Biology 106 was designed specifically for non-science majors, it does not exclude others. Science majors wishing to explore biology from a contemporary, humanistic, applied perspective also enjoy and profit from the course.

For further information, contact Professor Wayne P. Aspey, Department of Zoology and General Biology Section, College of Biological Sciences, The Ohio State University, Columbus, Ohio 43210.

CHEMISTRY

Chemistry Resource Room and Help Laboratory

Purdue University annually enrolls approximately 5,000 freshman chemistry students in seven different course sequences. Because of the size and complexity of Purdue's general chemistry program, the need for a resource area became apparent. Established in the fall of 1973 and financially supported through the General Chemistry budget, the Resource Room provides self-paced, study material--similar to that in other audio-tutorial centers--and lecture tapes, lecture notes, homework cribs, exam cribs, a file of old exams, and individual tutoring. Staff members work a total of 130 hours weekly in the Resource Room which is open 64 hours a week and has a maximum seating capacity of thirty-three in a room measuring 547 sq. ft. It is interesting to note that the fall 1979 semester averaged 596 student visits per day--with the number climbing each semester.

The initial concept of the Resource Room followed a remedial approach; it was to be a facility for helping freshman students who were having difficulties or likely failing their courses. The scope has broadened, however, in the following ways: (1) there is consistent usage by all chemistry students who are striving for higher grades, (2) an alternative learning path is provided for students who adjust poorly to large lectures and less individual attention, (3) unique auto-tutorial programs beyond the scope of commercially available material have been produced, (4) some upper level courses--particularly organic and physical chemistry--have recently been included with a goal of providing study material for all undergraduate chemistry courses, (5) many students utilize the facilities to review specific courses in preparation for "test out" exams, and (6) the staff is continually available for one-to-one discussions on a particular point--freeing professorial time for research and/or other projects.

The same Resource Room staff supervises general chemistry experimental "make-up" work in a 24-bench laboratory, which contiguously joins the Resource Room through a small office. Individual General Chemistry professors decide upon Help Lab admission requirements. Help Lab provides laboratory drawer contents and goggles for each student and maintains specific course chemicals for a two-week interval following each laboratory assignment. Help Lab students are aided with equipment set-ups and are supervised in their usage of chemicals. Laboratory data pages, however, are returned to be graded by each student's teaching assistant.

For additional information, contact either Judy Jackson, Director of Resource Room, or Dr. Derek Davenport, Head of General Chemistry, Department of Chemistry, Chemistry Building, Purdue University, West Lafayette, IN 47907.

COMMUNICATION

Communication--An Integral Component of the Learning Process

"Reading maketh a full man, conference a ready man, and writing an exact man. And therefore, if a man write little, he had need have great memory, if he confer little, he had need have present wit; and if he read little, he need have more cunning to seem to know what he doth not." For many recent university graduates Bacon's seventeenth century admonition has a prophetic ring; facing a marketplace where literacy is crucial to success, they have found an increasing need for memory, wit, and even cunning to conceal their impoverished verbal skills. The problem is widespread enough to have captured the attention of the Federal Reserve Board, that bastion of U.S. economic well-being. The Board last year funded a long-term study to determine what our national cost will be from having a workforce inadequately prepared for the sophisticated communications required by industry. The problem has drawn attention at the state level,too. Here in Wisconsin studies have been instigated by industry as well as by the statewide university system. UW System administrators, Philip Page and Seth Perelman (1980), found, for example, that a majority of recent U.W. graduates could not meet their employers' expectations for good oral communication. While the writing ability of graduates was perceived as somewhat better than their speaking skill, employers did not assign special strength to the writing ability of graduates. In addition, a more recent study undertaken by University of Wisconsin Engineering Professor Gretchen Schoff (1980) questions even this slight edge in writing skills. She found employers generally just as dissatisfied with the written communications as with the oral exchange of their new college graduate-employees.

While public outcry has marked the announcement of results for each new study, most of us on university campuses have reacted to each new set of findings without surprise. We had sensed for years a growing crisis in the communications skills of our students. We had observed with dismay the growing number of term papers that were really only first drafts. We had witnessed the feeble efforts of students to demonstrate comprehension of rudimentary textbook concepts. We had conversed with students who were incapable of sustaining a thread of coherent thought or argument. And, as educators, we had tried to respond to this crisis in literacy with program repairs. Reflecting the widely held beliefs that teaching writing is the responsibility solely of English departments and that improving speech is the province only of the Department of Speech Communication, many schools and colleges reacted to the crisis by merely increasing the credit hours in Speech Communication and English Composition needed by their students. At Madison, for example, the College of Letters and Sciences directed every department to certify writing competency for its majors. Moreover, as most departments within Letters and Science formulated their own recommendations for writing proficiency, they looked to courses in these two departments to record their students' progress.

The question is whether such efforts are enough to do the job by themselves? Can isolated courses in composition or speech give students what they need? Can students learn these skills in three or six credit hours and then apply them successfully in their other 117 or 114 credit hours needed for graduation? Can departments, colleges, and universities provide short-term remedial programs that alone will ensure the level of communication competence required for successful career and life experiences? Or, are we merely applying a bandaid to a deep wound?

A growing body of research suggests that the development of communication skills requires not only concentrated instruction but varied experiences and distributed practice as well. For example, James Britton's (1975) studies of writing development suggest the need for a wide variety of opportunities for personal writing (expressive writing) before the student can produce mature analytical work (transactional writing). Implicit in Britton's conclusion is the need to explore ways through which students can write expressively about a subject before they attempt more formalized written discourse. Similarly, Janet Emig's (1971, 1977) research on the composing process suggests that it involves a complex interlacing of speaking and writing which culminates in a student-teacher conference leading to the revised final product. Other studies seem to verify these perceptions. For example, both Bever (1970) and Winitz (1973) found that the processing of language is facilitated when listeners are permitted to interact. Similarly, Mattingly (1972) suggests that reading proficiency is enhanced by speaking and listening experiences since he discovered that the reader requires several types of linguistic abilities which are usually acquired through development of the speaking process. Thus, it would seem reasonable to conclude that communication skills should not be taught in isolation; rather, they should be used to reinforce and enrich each other through integrated experiences.

As integration is essential to the initial acquisition and development of communication skills, it can also be useful when students seek to communicate about the content of their chosen disciplines. In fact, if Britton and Emig are correct, only through the distribution of communication experiences throughout the curriculum will students achieve vital communication competencies.

At first glance, such a suggestion may appear threatening and burdensome. Faithful to our disciplines, we want to spend every possible minute in a semester giving students the information they need for subject matter proficiency. That is why we lecture so much. We have worked hard to become experts in a field. We know how hard it is for students to gather together materials that we have gleaned from years of research and reflection. So, efficiently and generously, we dole out quantities of facts students will later need if they are to bring sophistication and understanding to a subject area. To give students a chance to talk about ideas, we provide discussion sections, often run by a teaching assistant.

There, unfortunately, another lecture occurs, a meta lecture, where students often receive a reinterpretation of what they had heard earlier from us.

But there is yet another reason for our commitment to the lecture tradition. We learned in lectures; our parents learned in lectures; presumably, our grandparents learned in them, too. But all of us learned in a different time--one where telephones hadn't undercut letter writing, one where television hadn't undercut listening skills, one where cinema was an adjunct to culture, not its mentor, one where people read a great deal more than they now do.

So what might happen if we talked less and our students talked and wrote more in our classes? Will communication experiences enrich the learning of our students?

Communication Personalizes Knowledge. When we must speak or write about a subject, we face the choice of either parroting back what another has told us or of offering such insights in our own terms. For students, neither of these alternatives is bad. The elementary grasp of a subject is enhanced as students use the specialized vocabulary of the field in describing the elements that the professional observes. When students have to tell each other about what they have learned or have to write to themselves about what they have learned, they often make their first tentative steps toward being professionals. If they are further along in their learning, they can begin to use the images and figures which personalize their own understanding of the subject. In either case, as teachers we win. Our students will have found a place for what we have given them within the matrix of their own thought.

Communication Tests Thought. All education uses communication to evaluate student progress. And it is a truism that a real expert can explain the most abstruse theories to the widest variety of people. Our difficulty has been that we have engaged in such evaluations only two or three times a semester. We have acknowledged the worth of formal evaluations wherein we let students communicate. But we have not given students the opportunity to test their thoughts with us, with themselves, and with one another on a frequent basis. We have let ourselves do all the work, and often that has meant that we let ourselves do most of the learning. By putting communication skills into our classrooms on a very regular basis, we can turn the pattern around and let our students take their proper place as learners--learners testing their own capacities.

Communication Extends Thought. As active scholars, we have sought to draw inferences from knowledge and to extend our thinking through written and oral communication. We have all experienced moments when vague ideas become clear and when fragments of thought formed patterns as we placed our ideas to the test of oral or written expression. As we have profited from tinkering with ideas

through language, our students may learn from communication experiences that require the sifting and winnowing of knowledge in arriving at unique syntheses and insights.

If skepticism continues to abound, this is an appropriate place to stop reading. However, if you wish to consider simple, uncomplicated ways that our colleagues have found for integrating communication experiences into their classrooms, read on.

Integrating Communication Skills

In a Large Lecture Class

The large lecture course ordinarily engages only the listening skills of students. Since lecture classes often introduce students to an entire field, either by surveying bodies of literature, historical events, or habits of inquiry, or by summarizing general theory in chemistry, physics, botany, and mathematics, content in these courses is usually crucial for advanced learning in a discipline. Students will, consequently, need to learn how to apply this knowledge rather than merely recall it. By placing brief question and answer periods in their lectures, some professors have begun to ensure that this transfer takes place. One chemistry professor at Madison, for example, has students respond to questions about his lecture before they leave the hall for their next class. The responses are encoded on cards which are computer read and returned to the students at the next class meeting. Variants on this method occur in other classrooms where students midway through the lecture are asked to formulate two or three issues that the lecturer has implicitly addressed. Students are then asked to exchange their ideas with the person sitting next to them, and three minutes later the professor (whistle in hand) calls the class back to the second half of his presentation. Students refreshed by the break and more clearly focused on the issues underlying the lecture, have begun the important process of raising their knowledge of the subject matter from simple recall to the more sophisticated levels of comprehension and application.

In a Discussion Section

In name, discussion sections testify to a long-term educational commitment to active learning. Too often, however, they are passive places where only a few students interact. To return the discussion to its originally intended role, we need to hone Socratic skills. As Professor John Huntsberger (Brewer, 1980) of the University of Texas-Austin suggests, we need to create questions that will allow students to practice analysis, synthesis, and evaluation:

How does A compare with B? (Analysis)

What would be the ideal conditions for this experiment? this character development? this cell growth? (Synthesis)

Which of these five (characters, properties, chemicals) would be best suited to achieve X? What are the reasons for your choice? (Evaluation)

Our colleagues in the philosophy department have long held the key to good discussion of another kind: the open-ended quest. Such discussions look for extensions of knowledge and unique syntheses.

In both cases, the good discussion leader demonstrates the ability to make the classroom a place of exploration. All too readily we turn to the blackboard to graph out an equation or to explain the sequence of causes for an event. It is far too easy to tell the answer and apparently far too hard to help students discover it. One thing that good discussion leaders do quite routinely is to bring to their classrooms carefully constructed questions about and examples of the phenomena they will consider in a day's lessons. They are as conscientious about plotting out a way through a discussion as the expert lecturer is in making notes for a presentation. Through their expertise students learn to extend and apply the information that will give them a home in any discipline.

In Upper Division Courses

In upper division courses, opportunities for reenforcing student learning through integrated communication experiences increase dramatically. Because such classes are generally small, written and oral exercises can both be used by teachers without generating impossible paper loads or cutting back on time needed for class presentations. One undergraduate engineering seminar on the Madison campus, for example, requires both oral and written performances as a term assignment unfolds. In the assignment students must first present a five-minute speech describing a malfunction in a piece of equipment. Subsequently, the students must write a report analyzing the problem underlying the malfunction and relating it to some larger context within the discipline. Finally, the students must present and orally defend a solution to the problem. Such an assignment is a superb learning tool because it engages students at several different levels. By having to talk about the malfunction, students learn to describe an engineering challenge with clarity and precision. By analyzing the problem and its larger significance in writing, students learn to justify needed lines of research and inquiry. Furthermore, by facing the final aspect of the assignment--identifying and defining a solution to a problem--students get valuable practice in presenting and defending innovative solutions to engineering problems. Professors of upper-division courses in many disciplines are integrating communication experiences into their classrooms. Students in upper-division behavioral science courses are assigned group tasks in which students identify and defend a significant research topic, review

and orally summarize relevant research literature, and replicate, report, and defend a study. Students in upper-division humanities courses are asked, singly or collectively, to describe, create examples of, and/or evaluate instances of artistic forms or genre. Students in upper-division courses in all disciplines may be given opportunities to practice receptive listening and reading skills and to engage in expressive speaking and writing skills related to the discipline in question. Through these communication experiences, students learn to practice the communication habits that are vital to participation in professional life.

Conclusion

At the outset, this article focused on a problem that touches every academic discipline and most parts of the society for which universities and colleges prepare their students. We have suggested that the breadth of the problem requires a solution of similar magnitude. Such a solution will involve a large number of people in a variety of disciplines. To encourage that effort, we have offered argument and illustration to support the integration of communication skills into all areas of the curriculum. But following our own caveat--that prescriptive discussion has only limited value--we recognize that an article like this one is best viewed only as a beginning. Many of the methods and techniques through which communication skills will be integrated into classrooms and lecture halls across the curriculum are still to be discovered and still to be shared.

For further information, contact Ronald R. Allen, Department of Communication Arts, Abigail S. McCann, Department of English, or Dolores K. Vetter, Department of Communicative Disorders, University of Wisconsin-Madison, Madison, WI 53706.

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EDUCATION

The Indiana Model for the Science Preparation of the Elementary Education Major

Changes in the elementary teacher certification law motivated science and science education faculty to design cooperatively a series of courses integrating science content with planning to teach while students are gaining some early experience teaching science. A major purpose of the program is to make the science the elementary majors learn in their college classes applicable to their future roles as elementary school teachers. They can then incorporate science more successfully into their later teaching.

The model that evolved, which is a product of two years of planning, consists of three confluent streams: a content-process stream, a teaching methods stream, and an early-teaching-experience stream. (See Figure 1) The series is initiated by a basic science skills course (three credits) which focuses on improving mathematics skills and on developing the student's competencies with the American Association for the Advancement of Science-defined science process skills. It is followed in order by Biology (four credits), Physical Science (four credits), Earth Science (two credits), and Astronomy (two credits) courses. Each of these courses continues the process skill emphasis and pursues the study of content selected to prepare students: a) to teach the science that is found in existing curricular materials, b) to take advantage of locally existing science phenomena, and c) to use the science discussed in the popular media in their teaching. One-credit-hour methods courses are taken concurrently with the science courses. The methods courses focus on planning to teach science and provide the participants with early science teaching experience with small groups of elementary students. Students enroll in the sequence as freshmen and complete the eight-course sequence as sophomores or first-semester juniors.

For additional information, you may contact Hans Andersen (Education), Albert Ruesink (Biology), Judy Franz (Physics), John Droste (Geology), or Hollis Johnson (Astronomy), Indiana University, Bloomington, IN 47405.

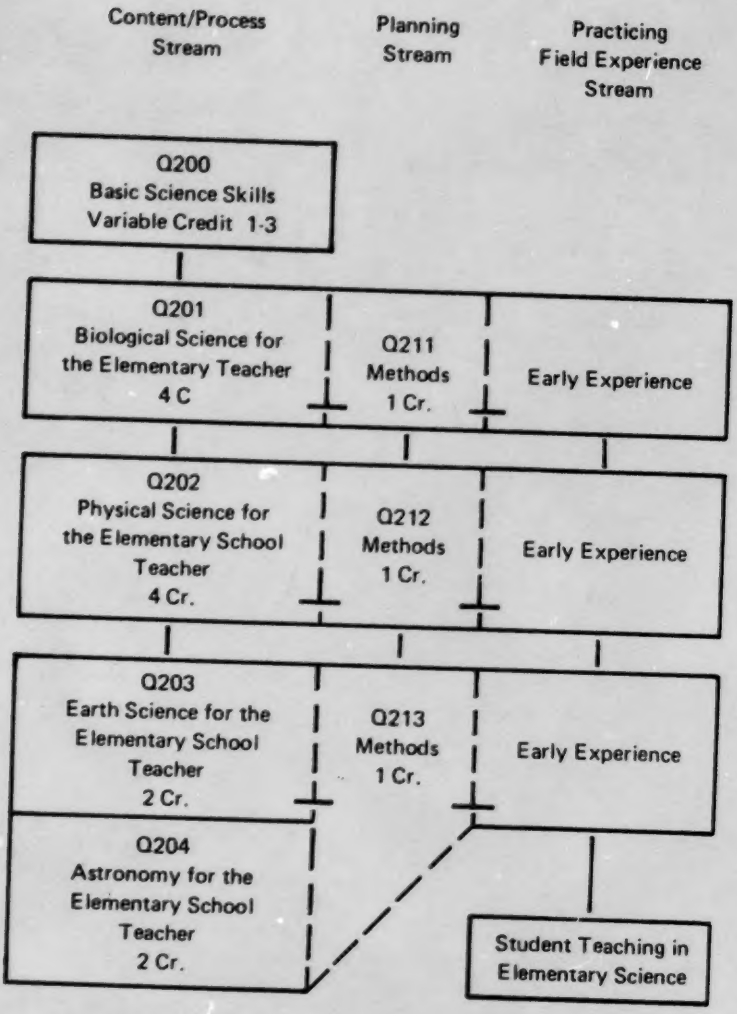


Figure 1. The Indiana Model

EDUCATION

Listening: A Modifiable Skill

Repeated studies suggest listening is the most used communication skill, occupying about 45% of communicating time. School systems, including universities, have not done much about this startling fact. In spite of this paucity, people seem interested in and concerned about their own listening skill. The few courses available in listening are reported as overcrowded, teachers of listening are in demand as guest speakers, study skills centers are searching for information about listening, and the 1978 amendment to the Education Act has declared oral communication a basic skill.

In 1979 the University of Wisconsin System, with leadership from the University of Wisconsin-Extension, embarked upon an ambitious program to improve the listening abilities of students in Wisconsin's schools and universities. The project calls for a five-step process:

1. Develop a K-12 listening curriculum.
2. Analyze the implications of that curriculum for teacher training.
3. Develop three teacher training course sequences for use in preservice and inservice education:
   a. K-3
   b. 4-8
   c. 9-12
4. Develop the necessary support materials for teacher use in implementing the curriculum.
5. Train and support preservice and inservice teachers as they implement the curriculum.

It is believed that the developmental process can be completed in 1981 with training to follow during the summer and fall of the 1981-82 school year. It should result in better listeners reaching college in the short-term future.

But there is no need for university faculties to wait for these better listeners. Teachers in any discipline in college can assist students to improve as listeners if they will employ some basic techniques associated with listening theory.

The most simple conceptualization of the listening process is the Minnesota Model, currently being presented by Dr. Lyman Steil of the University of Minnesota. That model, which is also used in the K-12 curriculum, says that listening occurs in four steps: sensing the message, interpreting the message, evaluating the message, and responding to the message. Teachers of diverse disciplines can carry out strategies to assist listeners at any or all of these steps.

To assure that the message is sensed at all (or heard) the professor could:

1. Provide a quiet classroom atmosphere.
2. Avoid distracting lecture habits such as passing out handouts while speaking of unrelated things.
3. Not tolerate competition to the message (nor compete by butting in).
4. Speak loudly enough.
5. Allow a "set" to obtain by observing class times or by providing oral cues.

The fact that different people interpret the same message differently comes as no surprise to teachers as testors. "Obvious" questions are given surprising interpretations by students. The problem of avoiding misinterpretations in orality is compounded by the speed of speech, physical condition of the listener, context of the message, vocabulary of sender vs. vocabulary of receiver, and so forth. Professors can work toward the elimination of misinterpretations and can teach listening at the same time by:

1. Checking regularly with students to monitor their understanding. Parroting (i.e., repeating only) may not be wise or useful, but questions seeking conclusions (i.e., rehearsing or paraphrasing) will tell the professor much and will alert students to an expected participatory role.
2. Encouraging questions from students about vocabulary of the field and the vocabulary of the speaker.
3. Facilitating student-to-student interchange of concepts.
4. Asking "What do you understand. . ." instead of just "Do you understand" and accepting few assumptions.
5. Repeating less. This teaches that the responsibility for gaining information rests with the listener as well as with the speaker.

"Evaluating" in the listening process implies that a listener has sensed, understood, and now may draw conclusions about purpose or worth of the message or the speaker. Professors could encourage active listening by:

1. Asking for conclusion-drawing.
2. Showing patience with questioners and questions.
3. Not assuming or producing "closure" (i.e., finishing the sentence for the speaker). The professor could be wrong!
4. Not second-guessing the purpose of the speaker. It is more efficient to hear him out. The tactic may encourage reciprocation.

Response is expected throughout. That is, the professor is advised to ask and to probe because there is no other convenient way of knowing what was assimilated by the listener. Memory is intertwined with listening as a kind of proof that listening did occur. We rely upon paper-and-pencil tests, mixing questions which request recall of written material with questions which request recall of oral material. Asking for responses before the paper-and-pencil test stage may tell the instructor about the interpretations being placed upon classroom utterances. Such demands for oral response placed upon students may force an expectation of participation accomplished successfully only through accurate listening.

These ideas are offered in the belief that listening is a more frequently utilized skill than reading or writing and that the way messages are encoded determines learning. People are interested in improving their listening, but an expectation of the value of orality must come from instructors themselves who employ orality hour after hour, day after day. What is gained if information flows from the instructor's notebook to the student's notebook with no expectation of retention, participation, or electricity happening in between?

For further information, contact Alice Ridge, University of Wisconsin-Eau Clair and Robert E. Clasen, University of Wisconsin-Extension, in care of Blair H. Mathews, Assistant to the Vice Chancellor for Academic Affairs, Bascom Hall, 500 Lincoln Drive, Madison, WI 53706.

ENGINEERING

Center for Instructional Development in Engineering

Increased undergraduate engineering enrollment and changing curriculum content created a pressure for instructional development in general, but particularly in engineering laboratories and design courses. To serve these needs, the Center for Instructional Development in Engineering (CIDE) at Purdue was created in 1977 under a three-year National Science Foundation Comprehensive Assistance to Undergraduate Science Education (CAUSE) program (Grant SER 77-05922). Three major goals were undertaken by CIDE during the grant period: 1) the creation of four projects for laboratory/design-course instructional development; 2) the development of a systematic mechanism for course and curriculum evaluation; and 3) the inauguration of an invited seminar series on instructional development. The Center has achieved these goals and has expanded its services to respond to the educational challenges common to schools of engineering.

Facilities

One of the functions of the Center is to provide staff support and service to the Engineering faculty in the area of instructional development. Activities range from answering simple questions on providing access to equipment to major efforts on specific problems. The physical facilities of the Center consist of a materials development area and an experimental teaching/learning area. The materials development area provides work space for four to six faculty members to engage in instructional development projects, carrels equipped with video and slide/tape equipment, and a conference area. Equipment available to faculty includes a copystand, slide duplicator, headliner, transparency maker, audio recording equipment, and a portable color video recording system. The Center staff, including a graphic artist, provides instruction or assistance in the production of materials.

The experimental teaching/learning area is designed to accommodate a variety of teaching/learning formats including small group design and seminar meetings and individualized instruction. The teaching/learning area has been scheduled at full capacity for the past year.

Instructional Development Projects

The four instructional development projects set forth in the CAUSE proposal have been completed: 1) Individualized Laboratory Instruction in Materials Engineering; 2) Computer-Aided and Managed-Design Instruction in Mechanical Engineering; 3) Laboratory Instruction Study in Civil Engineering; 4) Miniature Laboratory Computer Control Instruction in Industrial Engineering.

Evaluation

The evaluation staff planned and completed two major surveys (plus a variety of others) to identify priority needs and to help in planning future CIDE activities. The initial survey questioned 1977 B.S. engineering candidates on their college experiences. The corresponding survey asked local engineering faculty their views on instructional development. The survey results have been distributed and have been used in project staff discussions and plans, in meetings of the project's policy board, and in meetings of the Schools' Committee on Faculty Relations. Several papers and articles have been prepared from the results of these two surveys.

Course Evaluation Guide

A Course Evaluation Guide to assist faculty in assessing their own courses and to provide a mechanism for obtaining peer review has been developed. The Guide is designed to supplement student evaluation information available through Purdue's CAFETERIA Course and Instructor Evaluation System (Center for Instructional Services, 402 ENAD, Purdue University, W. Lafayette, IN 47907). The purpose of the Guide is to make faculty more aware of the possibilities of course design. The Guide examines a course from three perspectives: a) course characteristics--how the course is taught; b) subject matter--what is taught; c) assessment--how the results are measured.

Seminar Series on Instructional Development

An on-going seminar/workshop series is offered to raise the awareness level of the faculty and to cultivate faculty interest in instructional development. From this it is hoped that future projects will emerge.

Expanded Programs

A luncheon/seminar series in the spring and the Summer Faculty Instructional Development Program were outgrowths of Center activities. The luncheon/seminar series introduced participants to basic concepts of instructional development which could be implemented during the summer. The summer program then provided half-time support for faculty to concentrate on the instructional aspects of their courses as opposed to developing content. Both programs were very successful and have become part of regular Center activities.

For further information, contact John C. Lindenlaub, Room 234, Potter Engineering Building, Purdue University, West Lafayette, IN 47907.

ENGLISH

Evaluation of a Year-long Sequence of English Courses Emphasizing Scientific Writing

In order to improve undergraduate science majors' writing abilities, a three-term writing sequence was developed and offered on an experimental basis. Courses were developed by Dr. E. Fred Carlisle with Educational Development Program support and emphasized writing functional prose which was clear, unambiguous, and effective. Students were encouraged to develop their own writing style for scientific writing.

During the first year of the project, evaluation of the courses was primarily internal. Staff and student evaluations attempted to determine necessary and desirable modifications for the second year. During the second year, enrollment doubled and considerable effort was expended to implement and evaluate the changes incorporated from the first year.

As the courses were team taught by faculty from the English Department and GTAs from the Chemistry and Physics Departments, data was collected on the apprenticeship training model for GTAs and the effectiveness of the GTAs in teaching writing skills to undergraduate science majors.

Since the experimental course sequence appeared to be successful, it was proposed that it be added to the English Department curriculum as a permanent sequence. However, it was felt by the Provost's Office that the course needed a more in-depth evaluation and description before such a curricular decision should be made. The request for additional evaluation and description was prompted by recent changes in university requirements in general education and communication requirements.

Project Proposal

A great deal of data had been collected during the previous two years of the project. However, additional data was needed and a final evaluation report was to be prepared. Educational Development Program support was requested for a half-time GTA to help in the preparation of the final evaluation report and for collecting data and summarizing course procedures, questionnaire results, student scores, and written assignments.

Project Description

An evaluation plan was developed for this project which was not limited to the particular courses for which it was intended. The plan and the methods specified could be used to evaluate the relative success of any writing course. The method(s) involved collection and analysis of narrative, qualitative, and quanti-

tative data. Thus, a variety of different types of data were collected and analyzed, including student questionnaire results, figures on the fulfillment of various course objectives, data about the levels of acceptability of writing, description of course instructional procedures, writing assignments and evaluation practices, student test scores, actual samples of student writing, and costs of operating the courses. Because of the complex and comprehensive nature of the evaluation plan, a great deal more time was required to collect and analyze the data, and to prepare the final evaluation report than was originally anticipated.

Project Evaluation

As a result of the evaluation report developed during the third year of the project, the experimental courses in scientific writing were deemed to be successful. In general, the course objectives and, hence, the project objectives were achieved. The structure of the courses and the English faculty and science GTA team teaching model has proven successful and cost-effective.

Project Status

At present, the scientific writing sequence has strong support from the English Department as well as from the deans of the College of Arts and Letters and the College of Natural Science. The English Department has requested permanent approval of the courses from the University Curriculum Committee. In spring 1978, a two-year temporary approval was granted for English 104, 105, and 106. The approval is temporary only because of the continuing unresolved nature of the general education and communication requirements in the university. Although the status is temporary, the courses are now a part of the regular university curriculum, and it is anticipated that the English Department will reapply for permanent status when necessary.

For additional information, contact Dr. E. Fred Carlisle, Chairman, Department of English, 201 Morrill Hall, Michigan State University, East Lansing, MI 48824.

ENGLISH

Writing to Learn: Faculty Workshops on Undergraduate Writing

Writing, like any skill, must be constantly practiced and refined; thus good writing must be encouraged not only in composition courses, but in all courses, in all disciplines. All faculty can and should help students with the essential thinking processes of which writing is comprised, for, as many University of Minnesota faculty recognize, frequently students produce incoherent, poorly developed papers because they have not clarified what they want to say. In 1978, a university-wide survey indicated concern with the poor thinking reflected in incoherent papers, and a 1980 survey of fifty College of Liberal Arts faculty reflected similar concerns.

Participants in the latter survey were faculty interested in meeting to discuss their use of writing in undergraduate courses. In November 1980, thirty-two of these faculty gathered in small groups, each of which spent two three-hour sessions in exercises and discussions aimed at finding the most effective ways to help students. These workshops, funded by a grant from the University of Minnesota's Educational Development Program, were based on the idea that writing is a process of exploring ideas thoroughly and organizing them in a form which readers can understand--that, in other words, the writing process is a thinking process.

Because faculty who want to help students must first understand the causes of students' problems, the first workshop was devoted to exploring these causes. It began with an exercise which enabled faculty to experience the writing process from their students' perspective. Participants each wrote and revised a brief essay, then used the exercise as a catalyst for discussion. Noting that their essays improved as they became more certain of their intent and of their relationship to readers, they decided that student writers likewise need ample time to discover and explore ideas, preferably over the course of several drafts, and that faculty need to explain clearly the audience and purpose for each paper their students write.

In the second workshop, faculty explored specific applications of the theory and research discussed in the first. Attention centered on ways of writing clear, well-focused writing assignments and of selecting the few most helpful comments to give each student writer. In addition, faculty shared other techniques they had found useful, such as that of having students gather in small in-class groups to question each other about preliminary drafts of papers. Participants were pleased to discover that most of the techniques discussed in the second workshop can actually save more time than they take, for they focus students' and instructors' attention on the most essential thinking processes and result in papers which take less effort for instructors to understand.

Written evaluations of the workshops were very positive, indicating that participants believed their six-hour time commitment had been worthwhile. All agreed that the workshops had been useful; on the average, they checked "strongly agree" on a six-point Likert scale ranging from "very strongly agree" to "very strongly disagree." Moreover, the average participant "strongly agreed" that the workshops were worth recommending to a colleague.

For further information, contact Anne Hibbard, JoAnne Liebman, or Edward Griffin, Department of English, 207 Lind Hall, University of Minnesota, Minneapolis, MN 55455.

ENGLISH

Videotape Anthologies for an Introductory Film Class

At the University of Illinois, the introductory film course is a part of the English Department's core introductory sequence--English 101 (Poetry), 102 (Drama), 103 (Fiction), 104 (Film). The collective aim of the courses in this sequence is to teach the procedure and methodology of critical analysis, principally through careful scrutiny of the text itself. While the other courses had printed texts readily available, English 104 always suffered because of the general unavailability of visual texts in multiple copies for use in the individual classroom situation. This problem was partly solved through work carried out under an Undergraduate Instructional Award in the summer of 1979. The project involved the design and production of a library of seventeen videotape programs, each devoted to a single film director, subject matter, or theme. The result is An Anthology of Excerpts From Classic Films.

Before the project could be undertaken, a major issue had to be resolved. Some of the films used might be protected by copyright; would the taking of excerpts from these constitute copyright infringement? A carefully detailed prospectus specifying a maximum excerpt length and other relevant details was submitted to the university legal counsel, who rendered an opinion that the procedures described were a fair use of copyrighted works as defined in Section 107 of the 1978 Copyright Act. A second major concern involved loss of image quality. The transfer from 16mm to video not only lessens image resolution but also results in a loss of more than 20% of the surface of the original image. Would videotapes be a professionally defensible substitute for the original film format? Though it was recognized that videotapes had serious limitations, it was also held that they are nevertheless far superior to any of the other substitutes for an original text commonly in use, such as a textbook summary description, a printed script, or a few still photographs or frame enlargements.

The excerpts were recorded onto 3/4" U-Matic Masters. From these, multiple copies in 1/2" Betamax were made. The entire process was carefully monitored by television engineers from the Office of Instructional Resources to insure the highest possible quality reproduction of image and sound. There is no voiceover or other editorial apparatus on the tapes (only an identifying slide for each excerpt), so that each instructor can devise his or her own mode or presentation. Sample tapes include Hitchcock (excerpts from eleven films); Editing (seven key sequences, shown first at regular speed then repeated at 4 fps); Visual Style (similar subject matter treated by different directors, such as battle sequences from The Birth of a Nation, Alexander Nevsky, Henry V, and Welles's Falstaff); and Bazin (a visual illustration of his essay, "The Evolution of the Language of the Cinema").

The videotapes went into use during the fall semester of 1979. At the end of that school year, use statistics were compiled. These showed that 16 out of 17 English 104 instructors checked out the videotapes for classroom use, that the cross-course average was one checkout per instructor per week, and that the typical pattern of use was 2 to 3 excerpts per checkout. Evaluative information was also gathered by means of special questionnaires (one for instructors and one for students) designed and administered by the Measurement and Research Division. Predictably, the instructors expressed concern about visual quality, but nevertheless pronounced the tapes acceptable for classroom use and felt that they made possible a significant improvement in the quality of instruction in the course. On the student questionnaire, there were five questions involving the effectiveness of the use of the tapes in class. On all five questions the responses clustered around 4 on a scale of 5, a very positive and consistent response.

For further information, contact the project director, Robert Carringer, Associate Professor of English and Cinema Studies, University of Illinois, 100 English Building, Urbana, IL 61801.

ENGLISH

Inservice Education for Improved Student Writing--The Wisconsin Writing Project

A decline in the level of basic writing skills of students, elementary school grades through college, has been widely publicized and discussed in recent years. Students' standardized test scores show an overall decline, parents complain that their youngsters can't spell, and educators are accused of incompetence. Major national news magazines, such as Time and Newsweek, have featured scathing reports on teaching, and much of their criticism has been aimed at the teaching of writing. Because an individual's writing is so obvious an expression of his literacy level, general impressions about particular students as well as total programs are often made on the basis of single writing samples.

Nationally, several projects, such as the University of California-Berkeley Bay Area Writing Project, have been initiated to improve writing skills. One of the strongest reaffirmations of commitment to quality in writing instruction in Wisconsin schools is the Wisconsin Writing Project. The Wisconsin Writing Project is a joint effort of the University of Wisconsin-Madison School of Education, Department of Curriculum and Instruction; the College of Letters and Science, Department of English; the Wisconsin Improvement Program; the University of Wisconsin-Extension; with partial funding from the National Endowment for the Humanities through the Bay Area Writing Project. This University and K-12 school cooperative program has been well received, and the potential for improvement of writing competence among Wisconsin students seems promising.

The basic assumptions underlying the Wisconsin Writing Project are that:

(1) there is concern throughout Wisconsin that schooling needs to address itself to improving students' composition skills.
(2) there is strong interest in improving writing curriculum and instruction at the elementary, middle, and high school levels.
(3) teachers who examine, research, analyze current knowledge, and exchange their own experiences can grow and influence their colleagues.
(4) successful teachers of written composition can be prepared through an intensive summer institute to provide inservice programs in their own and other school districts.
(5) with the cooperation of school administrators and teachers, continuing education programs can be designed to meet the needs of schools requesting inservice work in teaching composition.

The project advisory committee guides the Wisconsin Writing Project in the development and implementation of the project. The advisory committee is composed of public school administrators, public school teachers, University of Wisconsin-Madison faculty members, and a representative of the Wisconsin Department of Public Instruction.

After three years of operation, the Wisconsin Writing Project has trained over seventy specially selected public school teachers to share with their colleagues from elementary through high school levels strategies to improve student writing. For the past three summers, teams of teachers (one elementary, one middle, one high school) were selected by school districts within commuting distance of the UW-Madison campus to point out that the development of communication skills is a continuous process by participating in a four-week institute offered for graduate credit. Participants were drawn from language, arts, social science, and science disciplines to demonstrate the importance of communication skills generally. The teachers received a stipend which covered tuition for the four-credit institute as well as travel expenses for the four weeks.

At the institutes, teachers researched and exchanged strategies for teaching writing. They polished their own composition skills by completing individual writing assignments as well as group projects. Over the years, they have developed fifteen writing guides which have been edited by the Project Director and Coordinators. Each guide covers one writing topic, presents practical classroom applications, and generally includes basic information as well as current research. The guide topics become the basis for inservice programs which are custom designed for school districts by Wisconsin Writing Project Coordinators and school district inservice committees. Guides written during the summer of 1978 are:

The Writing Process: From Pre-Writing to Editing
The Importance of Audience and Subject
Using Models to Teach Writing
The Role of Grammar in Teaching Writing
Evaluating Students' Writing

The 1979 institute participants produced the following guides:

Using Dramatic Performance and Oral Interpretation in the Writing Class
The Relationship Between Reading and Writing
Using Popular Culture to Teach Composition
Creating Materials for the Writing Class
Using Fieldwork Technique to Teach Writing

Summer, 1980, guide topics include:

A Guide to Writing Across the Curriculum
Providing Individualized Writing Experiences--Writing Labs and Writing Centers
A Guide to Helping the Gifted Student Write
Tailoring Writing Assignments for the Mainstreamed Student
A Guide to Helping the Reluctant Writer

In addition to improved strategies for teaching writing in their classrooms, project teachers share their expertise in teaching writing with colleagues in their own schools as well as with other districts via inservice presentations. Wisconsin Writing Project coordinators utilize project teachers as consultants for programs designed around district needs and offered through the Continuing Education Office of the School of Education, in cooperation with University of Wisconsin-Extension. Institute participants who staff these inservice programs receive compensation (according to the length of the program) as well as travel expenses for their service.

Various formats, such as half-day, full-day, or an after-school series of programs, have been used by school districts using Wisconsin Writing Project inservice programs. Breadth of programming has varied from awareness sessions in which teachers from every grade level and subject area participated to more focused, in-depth workshops offered for specific groups of teachers, for example, those who work with talented and gifted students. Evaluations of these teacher-led inservice presentations have been extremely positive as witnessed by the following favorable comments:

> "I enjoyed the sharing time. . . My needs were met."
> "The inservice tonight was very well organized. I enjoyed listening to the ideas you have used with your students."
> "An excellent inservice. I found it to be very helpful. Much material that could be used in the classroom was given."
> "Those of us who participated in the inservice session on November 2 were certainly pleased and impressed with the presentation. . . You both are to be commended for providing us with a program that was most beneficial, a characteristic most of our past inservices lacked."
> "Everything was applicable to my teaching situation. I particularly appreciated materials and ideas to take along for later reference."

The goal of the Wisconsin Writing Project is to meet the needs of students and teachers in Wisconsin. It continues to be a strong support for educators concerned with the quality of student writing.

For more information about the Wisconsin Writing Project and its publications, write to Nancy S. Haugen, 128C Teacher Education Building, 225 N. Mills Street, University of Wisconsin-Madison, Madison, WI 53706, or call (608) 263-4616.

GEOLOGY

Structuring Visual Instructional Materials for Geologic Concepts

Initial experiments were carried out during the past year in the preparation and use of slides to present geologic and hydrogeologic concepts based on notions derived from perceptual learning. The preparation of slides treats the basic geologic observations and principles as invariances across successive images progressing through transformations of time, space, and degree of abstraction. The importance of given features or concepts, as invariances, is rendered by stylization, animation, and reduction of detail to create a visual hierarchy of ideas easily followed. The general approach is to start out with a slide of the natural or field condition, to schematize the important features of the real situation by first remaining as close as possible to the scale and geometry of the original, and to abstract form and content progressively. For example, the sequence may go from an outcrop to a line drawing of the stratigraphic units with the same outline and shape on the outcrop, then that of the hydrologic units, their sections showing the nature of the aquifer material, and finally, graphs and diagrams of the hydrolic properties of the aquifer. The original slide is shown periodically with the abstract presentations to train the student in recognizing the patterns and invariances. The method is further enhanced by approaching the subject on different scales, such as general map, aerial overview, outcrop, geologic structure, hand specimen, and microscopic slide.

Reactions to the materials by the students have been highly positive. Students have been especially favorable in their reactions to having examples from the local area and/or examples from the instructor's visits and preparation efforts. Based on the results of the initial experiments, funds have been granted by the University of Minnesota's Educational Development Program to develop materials relevant to additional concepts.

For further information, contact Professor H. O. Pfannkuch, Department of Geology and Geophysics, 2D Pillsbury Hall, University of Minnesota, Minneapolis, MN 55455.

LANDSCAPE ARCHITECTURE

LARCH: A Computer-Based Instructional Program

Basic courses dealing with problem-solving traditionally tend to employ classwork/homework problems to check students' skill at using the course content. The homework cycle of "assign-correct-return" often creates a lag of several days before students can receive "feedback" and remedial assignments.

The Department of Landscape Architecture at The Ohio State University has developed a computer-assisted/computer-managed instructional program for Landscape Construction, 322: Site Systems--a "problem-solving" course.

LARCH (Landscape Architecture Computer Heuristics) is an interactive, computer-based instructional program with diagnostic and prescriptive capabilities for helping students solve problems and develop problem-solving skills. Heuristics from the Greek "heurisko" originally meant "to find or to discover," and later "to find for one's self, to devise or to invent." LARCH is essentially a computer program which provides guidance (in the form of feedback) by which a student may discover the mistakes he or she makes while working toward a correct solution.

Development of LARCH was begun in 1976 and covers course content for Landscape Architecture 322, an upper division major course. It is organized into 4 units, 19 modules, 56 problem types, and 124 objectives. The content includes land forms, surveying operations, horizontal and vertical road alignment, and storm-water runoff. In each module, the program creates a new set of data within the parameters of each problem type for each student. In addition, the program checks each student's response for accuracy, gives tutorial feedback, and records the student's performance. The system allows each student personalized tests (no cheating), the opportunity to self-pace, and immediate access to his or her test record. The savings in time spent correcting errors, keeping records, and creating new problems has allowed the instructor to spend more time with those students having difficulties and also has permitted a reduction in required staffing for the course.

LARCH simulates student mistakes by solving each problem "incorrectly" several ways, making the same mistakes which students have been observed to make previously. When the student's answer matches the program's deliberate "wrong" answer, LARCH "knows" what the student did wrong. In this sense, LARCH responses to student errors are based on a pathological model of problem solving.

LARCH has extensive capabilities to adapt problem-solving instruction to individual students, including special types of feedback for specific student responses related to specific problems. In addition, the "manager" component of LARCH not only records scores on unit tests but also keeps data regarding student

progress, numbers and types of practice problems that each student works. LARCH permits students to choose the instructional sequence of units, modules, problem types, and objectives. Students may access their records at any time. The management and data-recording techniques of LARCH are not content specific. Indeed, methods developed in LARCH have been successfully applied at The Ohio State University in such diverse fields as music and foreign language instruction.

About 75 students use LARCH each Winter Quarter, accounting for almost 3,100 instructional hours in 4 offerings (1977-1980). Nearly all students eventually solve all the test problems in LARCH, representing all areas of course content and a broad range of problem complexity, but although "last-test" scores are uniformly high, errors in practice exercises and the amounts of time to complete exercises vary considerably from one student to another.

Apparently a large majority of the students enjoy problem solving with LARCH and are able to use the skills developed with it in classroom and out-of-classroom assignments. Student reaction to LARCH has been highly positive, as evidenced by responses on Student Evaluation of Teaching (SET) forms. From available data University-wide, 55% of the students either "agree" or "strongly agree" that program learning modules (where used) aided learning in their course, as compared to 86% of the students using LARCH.

Current research involves sophomore and junior design course content with emphasis on topographic interpretation, design critiques, and spatial visualization. These modules involve the use of a Magnavox Orion-60 plasma display system including computer-controlled random-access rear slide projection with graphics overwriting and a touch-panel. Students will be asked to identify landforms and sections, to locate problem areas and conflicts in design solutions, and to make decisions based on higher-level cognitive processing involving visual discrimination.

For further information, please contact J. Brooks Breeden, Department of Landscape Architecture, College of Engineering, The Ohio State University, Columbus, OH 43210.

II. Institutional Support

EXTRA-DEPARTMENTAL PROGRAMS FOR THE INDIVIDUAL STUDENT

A Holistic Approach to Special Academic Services

The Purdue HORIZONS Special Services Program was funded in September, 1978, through the U. S. Department of Education. Students are selected to participate in the program after being admitted or they are referred to the program by the academic departments or schools. At present, students are selected on the basis of high financial need and/or academic deficiencies as evidenced by SAT scores, high school preparation, and a prediction of academic performance as determined by the Admissions Office. By supplementing existing services within the university and implementing additional program services, HORIZONS has developed an intensive, holistic program geared to improve the quality of academic performance and increase the retention of nontraditional students at a predominantly white, highly competitive, science and technically oriented institution. Program services are designed to:

1. enhance academic strengths and strengthen academic weaknesses related to the student's chosen discipline;
2. clarify career choice and development commensurate with the student's abilities and interests;
3. enhance and maintain every student's positive self-concept;
4. increase personal effectiveness; and
5. stress involvement and identification with the university.

Upon the entry of students into the program, comprehensive packages are developed for them based on their individual academic and nonacademic needs as determined by diagnostic measures.

Though each of the academic schools is represented in the program, the majority of students are enrolled in the Schools of Engineering, Science, Technology, and Management. The major problems encountered by HORIZONS students are related to academics. Inadequate preparation in the math and science disciplines in high school results in considerable difficulties for freshmen in reconciling their actual academic performance at the university with their high expectations based on their high school grades. Thus, the complex, interrelated needs of these students require a holistic, interventionist approach that integrates the services of both the academic assistance and student development components.

Academic Support Component

Students encountering university level work for the first time have not developed the independent learning strategies which will enable them to be successful in the college setting. An effective academic support program must not only address specific discipline material and general study techniques, but also those techniques applicable to particular disciplines. Maximizing the

effectiveness of training in such skills involves unified presentation of study skills in a context which allows for immediate use, habituation, and resultant grade improvement during the period of tutoring and study-skills instruction. The need for such discipline-oriented and course-relevant programming is particularly important in the student's freshman year, when she or he establishes new habits for college-level work. Although the short term goals of a tutoring program must by necessity include assisting the student in the course work at hand, the long range goals must include helping the student to become an independent learner.

HORIZONS students requesting academic assistance are required to participate in a preliminary conference which includes a review of their needs assessment and diagnostic profile, an evaluation and analysis of assistance and university resources they are currently utilizing, and the signing of an academic assistance contract. Tutorial assistance and study/learning and collegiate skills development are provided appropriate to the individual needs of each student.

Student Development Component

The interdependence between self-concept and academic achievement has long been acknowledged but seldom acted upon in higher education. HORIZONS recognizes that affective concerns, i.e., self-esteem, achievement motivation, and attitudes, are significant factors in a student's academic success. Indeed, there is a positive correlation between academic achievement and a positive self-concept, a feeling of personal worth, and experience of internal control. To complement the services provided by the academic support component, the student development component's major goals are to provide services that will assist program students in developing strategies for: (1) coping with the rigorous academic demands of the university system, (2) reducing stress and anxiety, thereby freeing them to give their full attention to academics, and (3) realizing to the fullest extent their personal growth, leadership development, and interpersonal and human-relations skills development. Workshops and seminars in career selection and planning, improving self-concept and coping behaviors, building support systems, personal and professional communication skills, assertiveness training, and test anxiety are offered, as well as personal counseling.

Summary

Having just completed the second year of operation, the program does not yet have enough data to evaluate its success in retention in terms of students graduated. Data collection and program evaluation are ongoing processes with a major goal of identifying those factors which impact on the retention of non-traditional students at Purdue University. Based on staff experiences and observations and feedback from program participants, it is clear, however, that the

holistic approach to retention that HORIZONS has implemented has had very positive effects on program students' adjustment to the university environment and on their academic performance.

For further information, contact Dr. Carole Johnson, HORIZONS Program, Office of Special Academic Services, South Campus Court C, Purdue University, West Lafayette, IN 47907.

EXTRA-DEPARTMENTAL PROGRAMS FOR THE INDIVIDUAL STUDENT

The Indiana University Learning Skills Center: Extending Resources Through Linkages

The Learning Skills Center at Indiana University in Bloomington has undertaken the mission of serving all 30,000 students on campus, ranging from freshmen to dissertation-writing doctoral candidates. The scope of this mission may suggest that the Center is a large operation on campus with an extensive and diversified staff and spacious facilities. In fact, the Center operates with the equivalent of three full-time professionals, one secretary, and about fifteen part-time graduate instructors. By utilizing these resources to the fullest, however, and taking full advantage of opportunities for cooperative linkages with other departments and service programs, the staff has been able to accomplish a great deal more than its size would indicate.

Among the groups served are high risk students in a special summer bridge and freshman-year-support program; regular-admission students identified as potentially weak in textbook reading skills; undergraduates needing general improvement in study habits and attitudes; academically talented undergraduates seeking to polish already strong skills; foreign speakers; students seeking admission to professional schools; graduate students; residence hall groups; discipline-based classes; and faculty. In addition, the Center offers training for graduate students in college reading and learning skills development, carries out research, participates in regional and national conferences, and maintains a unique linkage of an academic department and administrative unit through the joint appointments of both the director and the assistant director to the School of Education faculty and the Division of Student Services staff.

Other important linkages for the Center are with the Department of Residence Life, the Groups (Special Services) Program, the Office of Learning Resources, the School of Continuing Studies, and the University Division. Largely through both formal and informal cooperative arrangements with these units, the Center has succeeded over the past two years with its plans for growth and increased responsiveness to the changing needs of the student population.

The outreach begins with the Groups summer bridge program, with the Center providing a major component for all of the 300 students admitted to the campus on a provisional basis. For the past two years, the Center and the Office of Learning Resources have cooperated on a specially designed course featuring lecturers from the Psychology and Sociology Departments, in an effort to accustom the incoming students to what happens in a classroom situation. The students attend large group lectures one evening a week, read and study the accompanying textbook material, and take authentic freshman level tests over what they have learned. Along with this activity are classes in the Learning Skills Center where they learn techniques and strategies for handling college level material.

To provide follow-up, the Groups Reading Tutorial program is linked with the Center's Basic Skills course, and many students continue to use the services throughout their freshman year.

The Residence Life program is still being developed, but the Center staff is already involved in an active workshop program for students in the campus living centers. One hour programs on listening and note taking, strategies for test taking, time management, and general study skills are offered almost weekly at various sites on campus. A comprehensive orientation program, which will be offered in cooperation with the Career Center and the University Division as well as Residence Life, is now being designed. The Center also participates in the training of residence hall assistants and orientation assistants, and, with the help of the Office of Learning Resources and the Department of Radio and Television, a series of videotapes for training student personnel is in production.

For the past two years the Learning Skills Center has been developing a highly innovative program for the refinement of basic skills in reading at the college level, including textbook reading techniques. This is a cognitive and language-based program which draws upon the most current theory and application in reading. Students learn strategies for mapping information; relating information from various sources, including texts and lectures; developing complex structures of knowledge which can be further expanded as new information is acquired; and using their own language as a vehicle for learning. This course has attracted attention nationally and is being used as a model at other institutions. The Center staff has worked closely with the faculty of the Reading Program and the University Basic Skills Committee in the design and support of this program.

Also for students encountering reading and learning problems, there are three half-semester courses that approach reading and study skills from various angles. One emphasizes the creation of an "Individualized Learning System" and its applications. A follow-up course enables the students to continue with a completely self-designed improvement program. A close working relationship with the advisory staff of the University Division, as well as frequent communications with undergraduate advisors in the schools and colleges, are important factors in getting the right students enrolled in these courses.

In the summer of 1980, a program combining reading and writing instruction was piloted and taught cooperatively by instructors from both the Learning Skills Center and the English Department. The fate of this successful experiment has yet to be decided, but it is definitely regarded as the initiation of further cooperative programs between these two departments. Many of the instructors at the Center, as well as many members of the administrative staff, have a background in English and are philosophically committed to the importance of combining

instruction in reading with instruction in writing. As a move in this direction, during the 1980-81 academic year the Writing Center will be housed in the same building as the Learning Skills Center, allowing the two staffs to refer students back and forth.

A recent project in the Center has been the development of information about specific disciplines and the creation of content modules for students having difficulties in particular areas. The prototype module, now nearing the pilot stage, is for the study of foreign languages. This module will include both computer and textbook materials, along with a complete index for using them.

In the spring of 1980, the Center acquired a PLATO terminal, and since that time the staff has developed a Learning Skills curriculum, put together from resources available in the PLATO catalog along with some original material. The application of computer-assisted instruction in foreign language study has already been mentioned. Also, in the 1980 summer bridge program, high-risk students were taught to use the computer for specific vocabulary and concept review in psychology and sociology. According to the results of a psychology test given to all students in the summer program, those who worked systematically on the terminal did significantly better. From this evidence we are hopeful of expanding this resource as a major Center learning aid in the future.

The more advanced student has not been left out of the Center's programs. Groups designed to prepare students for the Law School Admissions Test have been organized and have proven to be very popular. In this effort, the Center worked with the Office for Preprofessional Counseling. In cooperation with the School for Continuing Studies, the Center staff offers similar prep sessions for the Graduate Record Examination, as well as courses for college-bound high school seniors and programs for returning and part-time students. Another area which the staff is developing is reading efficiency training for graduate and advanced undergraduate students. For the second year, a seminar series is being organized for students in the graduate residence hall which address problems related to qualifying examinations and dissertation writing.

In addition to offering these service activities, the Center has become a training site for students who wish to go into college learning and reading skills development as a career. Besides teaching and research assistantships, the Center offers internships for credit and a graduate level course in college reading. Students in this course gain a theoretical knowledge of reading and learning at the postsecondary level as well as practical information regarding program organization and course planning. Instructors in the Center who do not have a background in the area of reading are requested to take this course as part of their inservice training.

Among the research projects in which the Center staff participates are a study in retention strategies for college textbook passages, an examination of the use of retellings for assessing comprehension, and a longitudinal study of students who take learning skills courses. In addition, Center staff regularly present program descriptions at regional and national conferences. Services for faculty, so far, have included textbook reviewing, specialized presentations in classes, and individual consultation when requested. The Center is about to administer a survey assessing faculty perceptions and needs in the area of student academic development.

All in all, the Center takes seriously its function as the primary academic development unit on campus, and the staff will continue to seek ways to work with other units in order to make the most of limited resources in tight budget times. After all, that is what it means to be a center.

For further information, contact Dr. Sharon Smith, Learning Skills Center, 316 North Jordan, Indiana University, Bloomington, IN 47405.

EXTRA-DEPARTMENTAL PROGRAMS FOR THE INDIVIDUAL STUDENT

Iowa Regents Universities Bachelor of Liberal Studies Degree

Universities, particularly the publicly supported ones, have always made at least some effort to serve "students" other than those enrolled for full-time course-work on campus. Such efforts, however, have traditionally been viewed as a part of the general service responsibility of the university rather than a part of the general teaching responsibilities. Typically, in fact, such "service" oriented activities, even when they involved coursework identical to that offered "regular" students, have been offered through a separate division or college with specifically defined limits on how much credit obtained through that college could be applied toward a degree.

This began to change by the late 1950's and early 1960's, and by the early 1970's most states were beginning to look seriously at the possibility of developing degree programs for "non-traditional" students. Although there were some differences in the definitions of who these "non-traditional" students were, they were generally defined as adults who for one reason or another could not attend college as full-time, on-campus students but were interested in obtaining a baccalaureate degree. The major difference between this group of students and those who had previously been served by universities was that these were students who were interested not only in taking coursework but wanted this coursework to lead to a baccalaureate degree.

In Iowa the earliest movement in offering such a program came from the State Extension and Continuing Education Council. In 1975 the State Board of Regents became involved and directed the three state-supported universities in Iowa to develop plans to offer an external degree for non-traditional students. Although the institutions involved (University of Iowa, Iowa State University, and University of Northern Iowa) were given a good deal of freedom to decide for themselves what the program should look like, it was very clear that what the Regents envisioned was a degree that could be completed off-campus and which involved a high level of cooperation and coordination among the three universities. Each university appointed its own on-campus committee to work with the faculty on that campus in the development of such a program and also appointed its representative to an inter-institutional committee which was to coordinate the efforts among the three institutions.

As might be expected, there was a good deal of disagreement within these groups concerning both the content of the program and how it should be administered. At the one extreme were those who favored each institution offering its own degree, with inter-institutional cooperation and coordination in course delivery. The advantages cited for this approach included: (1) it could be implemented at a minimum cost; (2) it represented a good first step in developing inter-institutional cooperation without requiring any major changes in existing programs

at the institutions; and (3) each institution and its faculty would control its own degree. At the other extreme was the suggestion to establish a separate statewide entity with its own staff to offer the degree. Although the primary responsibility of this staff would be to provide advising and other student services and to coordinate the course offerings of the institutions involved, it would also have the authority to set requirements for and grant its own degree. The major advantage cited for this approach was that it would assure coordinated planning, advising, programming, and course delivery.

What emerged after many months of discussion was the Iowa Regents Universities Bachelor of Liberal Studies Degree. Although it has the same name at all three of the Iowa Regents institutions, and all three adhere to the same general set of guidelines in setting requirements, each degree is awarded by one of the universities--the faculty of that university having established the specific requirements for the degree. At The University of Iowa, the degree is offered by the College of Liberal Arts, at Iowa State University by the College of Sciences and Humanities, and at The University of Northern Iowa by the entire institution. This approach has at least three significant advantages: (1) the common name and general requirements eliminate some of the confusion that would result if each institution offered a different degree with completely different requirements; (2) while encouraging cooperation among institutions, it still allows each institution to maintain its autonomy and provides the student with some of the advantages associated with the diversity among them; and (3) it does not require a large separate staff to administer.

General Requirements for the B.L.S. Degree

The Bachelor of Liberal Studies Degree requires a total of 124 semester/186 quarter hours. Forty-five/seventy of these hours must be earned at a four-year college in courses defined by that college as "upper level." Forty-five/seventy must be earned in courses at Iowa Regents Universities and thirty/forty-five hours must be earned in the Regents institution awarding the degree after admission to the B.L.S. program. If a student enters the B.L.S. program needing fewer than 30/45 hours, the student may seek a waiver of the after-admission hours requirement.

The B.L.S. also has a general course distribution requirement. Each student's program must include a minimum of 12 semester/18 quarter hours in three of five areas. The areas are (1) humanities, (2) communication and arts, (3) natural sciences and mathematical disciplines, (4) social sciences, and (5) professional fields. Each institution is allowed to identify the courses which it offers that lie in each of these five areas. Of the 36/54 hours required in the three areas the student chooses, 24/36 hours must be upper level courses and at least 6/9 in each of the three areas must be in upper level courses. A further restriction

is that no course can be used to satisfy both the distribution area requirement and the general education requirement.

Admission to the B.L.S. Program

Students may be admitted to the B.L.S. program if they meet either of the following criteria: (1) hold an Associate of Arts or Associate in Science Degree from an accredited two-year college; (2) have at least 62 semester/93 quarter hours of collegiate work acceptable for graduation at the Regents institution from which they expect to receive their degree, with a cumulative grade point average of at least 2.00.

If a student is interested in enrolling in the B.L.S. programs, he or she contacts the admissions office at the Iowa Regents institution from which she or he plans to receive the degree. The admissions office, in conjunction with B.L.S. educational advisors, evaluates the student's previous coursework and decides whether or not she or he is eligible to be admitted into the program. The B.L.S. educational advisor assumes major responsibility for counseling interested students about the specific procedures to be followed in making formal application and answers the questions prospective students might have about the admissions process. If the student is not eligible for admission, the B.L.S. advisor can help the student play ways to meet the requirements.

Specific Requirements for the B.L.S. Degree at The University of Iowa

The B.L.S. degree at The University of Iowa is offered through the College of Liberal Arts, and all students working on the degree must meet the Basic Skills and the Core Course requirements of that college. The Basic Skills requirement is divided into three parts: rhetoric, mathematics, and physical education. The Core Course requirement is divided into four parts: literature, social science, natural science, and historical cultural. There are a number of ways in which students in the B.L.S. program can meet these requirements. Students who hold an A.A. or A.S. degree and who have completed at least 62 semester hours of credit are considered to have met all of the Basic Skill and Core Course requirements for the B.L.S. degree. The requirement may also be met fully or in part through the college-level placement program. Individual requirements may be met through equivalent coursework taken at other institutions.

Students can fulfill the other requirement for the B.L.S. through credit earned in a number of different ways. There are, however, two major restrictions placed on where this credit is earned. At least 45 of the 124 semester hours in the total program must be earned in courses at the Iowa Regents Universities. If a student has never attended any of these institutions, he or she must complete these 45 hours after admission to the program. The second major restriction is that at

least 30 semester hours must be earned from The University of Iowa after admission to the B.L.S. program unless a waiver is granted.

Current Status of B.L.S. Program

As of October 31, 1980, a total of 381 students have been formally admitted to the B.L.S. program at the three universities, with women outnumbering men 228 to 153. Thirty-three students have received the Bachelor of Liberal Studies degree.

The majority of students admitted to the program, 299, are Iowa residents. The state of Iowa is divided into 15 merged area school districts. Although the largest number of students in the B.L.S. program come from those area school districts in which the three Regents institutions are located, there are at least some students from all 15 of these districts.

The majority of students, 248, are between 21 and 35 years of age. There are, however, at least some who are over 65.

The three most popular modes of coursework are classes taught on the campus of the university where the student is enrolled, off-campus courses offered through that university, and correspondence courses. Among the other options used by students are coursework at other four-year colleges, television, radio and newspaper courses, and, occasionally at least, evaluation of prior experiential learning.

Major Problems With the B.L.S. Program

A persistent problem with the B.L.S. program has been the lack of state funding for all aspects of the program. A basic assumption in the development of the program was that adults working closely with an educational advisor would be able to develop their own program within the constraints established by the requirements for the degree. A major problem, especially as the program grows, will be making enough advisor time or other guidance options available to the students. It has become increasingly evident that adults who have been out of school for a period of time need a good deal of guidance in planning a program and in choosing courses consistent with that plan. The program was, unfortunately, begun at a time when funds were becoming very short, and there was not enough money available to hire the number of advisors required to make the advising system work smoothly. An increase in the number of advisors is essential to permit them to be more accessible to B.L.S. students, whether on campus, by telephone, or by visiting local sites. Other guidance-related ideas have been briefly considered but not implemented. These include development of annual or semi-annual group orientation sessions on each campus; the installation in selected sites around the state of a computer-assisted guidance system such as the Council for the Advance-

ment of Experiential Learning's Project LEARN has produced, and systematic assessment of problems encountered by adults in the program as it continues.

The program's operation is further complicated by problems related to the lack of availability of sufficient credit options. Although all three institutions have a number of off-campus and media courses, many but not all of which may be applied toward the degree, and The University of Iowa and The University of Northern Iowa offer approximately 200 correspondence courses which are applicable to the degree, the courses needed to fill in a given student's planned program of study are frequently not available at a time or place nor in a form that makes them accessible to the students in the B.L.S. program.

Future Plans for the B.L.S. Program

Any discussion of future plans for the B.L.S. program must include the problems related to guidance information, advising, course delivery, program evaluation, measures for quality assurance, and administrative support to insure the development and maintenance of sound operation. An increase in the number of advisors is essential to permit them to be more accessible to B.L.S. students on campus and off campus by telephone, and by visiting local sites.

Required or optional orientation sessions may also be needed for all admitted candidates before their status is classified as "active." This could reduce the need for some of the individualized advising, and, at the same time, enhance the quality of the services to students. A comprehensive computerized guidance and referral service would help not only adult learners who are enrolled in or considering the B.L.S., but also others who may face career crises or other midlife changes.

The solution to the problem of course delivery is going to require a careful look, not only at when and where courses are offered, but also at the form they take. It will also require a look at other credit options. The traditional way of physically transporting faculty to off-campus sites cannot continue to be the major approach. The costs in terms of transportation, faculty time, and faculty fatigue are prohibitive. This means a careful look must be taken at other alternatives which involve the use of both the "old" technology (print) and the "new" technology (videotape, videodisc, television, telephones, and computers).

Those working with the B.L.S. program must look very carefully at sponsored experiential learning and at nonsponsored experiential learning credit options. Some sponsored experiential learning options already exist in the form of field experience education courses, internships, practica, apprenticeships, independent study options, cooperative education, clinical experiences, and other sponsored learning activities where the student is directly in touch with the realities being

studied. Out-of-class learning contracts could provide additional credit option if systematically developed and promoted.

Nonsponsored experiential learning is college-level learning based on personal/work experience acquired without supervision of the postsecondary institution. Such learning must be properly assessed and credit recommendations applied. The following four basic assessment modes have been used in connection with nonsponsored experiential learning: (1) inter-institutional proficiency examinations (e.g., CLEP, PEP, CEEB/AP); (2) equivalency procedures (The American Council on Education's National Guide to Educational Credit for Training Programs, ACE's Guide to the Evaluation of Educational Experiences in the Armed Services, and the New York Regents' Guide to Educational Programs in Noncollegiate Organizations); (3) portfolio, a carefully organized written communication to appropriate faculty representatives requesting credit or academic recognition and providing supporting documentation prepared in accordance with institutional guidelines as evidence of the college-level learning acquired; and (4) other locally-developed procedures such as departmental or institutional examinations or individual assessments not requiring a portfolio.

Broad definitional statements of intended outcomes are needed for each of the five B.L.S. distribution areas. With a clarification of the range of competence areas suggested by each distribution requirement, the process of matching students' learning with degree requirements would be greatly facilitated and the prospect for incorporating additional credit options enhanced. The development of quality assurance procedures such as these will require considerably more staff and resources than are currently available.

The development of other quality assurance measures awaits evaluative data on many aspects of the program. Because the B.L.S., like other external degrees, is expected to "prove" itself to avoid being suspect, the B.L.S. Inter-institutional Committee and other staff have reviewed federally funded evaluation models developed for the Wisconsin and the Illinois extended degree programs. In the Wisconsin program twelve major aspects are systematically reviewed for needed improvements or for evaluative considerations. The Illinois program is very similar. B.L.S. program staff and committees have also examined the COMP-ACT which is a vital part of the Wisconsin and Illinois models.

The Iowa Coordinating Committee for Continuing Education (ICCCE) has appointed the Task Force on Experiential Learning which has been given the charge to determine what the public and the private institutions in Iowa are doing in the area of granting credit for experiential learning, to identify and explore some of the issues relative to the transfer of such credit, and to study the concept and draw up recommendations and suggest guidelines that might be useful in assuring quality experiential learning credit options. This task force works closely with CAEL, The Council for Advancement of Experiential Learning.

ICCCE has also appointed the Task Force on Noncollegiate Sponsored Instruction which works closely with the American Council on Education's Program on Noncollegiate Sponsored Instruction "in furtherance of this Program and of other credit opportunities for working adults."

For further information, contact Professor Lowell F. Schoer, 361 Lindquist Center for Measurement, The University of Iowa, Iowa City, IA 52242.

FACULTY DEVELOPMENT

A Program to Improve the Teaching of Graduate Assistants and Other Faculty

The Campus Teaching Program, as it is called, is designed to provide graduate teaching assistants and faculty with information and training to increase teaching competence. The program is usually offered through cooperating departments and may be tailored to complement related activities found in the departments. Program staff provide seminars on a variety of teaching topics, and departments are free to choose those topics that are best suited to the particular teaching situations faced by their teaching assistants. In addition, departments can interweave content considerations with teaching-methods information.

Depending on when the series of seminars is to start, departments often choose to begin with a discussion of the problems to be dealt with on the first day of class. Other seminars include sessions on lecturing as a teaching method, the effective use of classroom questions, and handling a classroom discussion. Instructional media, the construction of classroom tests, and the problems associated with grading are also covered in separate seminars. Most departments choose to include a seminar on the evaluation of instruction during which a rationale for evaluation as well as a variety of methods available to accomplish it are covered.

An important element in the program, and one that no department has failed to include, is the use of videotaping of classroom teaching. Videotape is used in two ways: first, in a regular microteaching format in which teaching assistants teach to their peers and in turn are critiqued by them, and, second, in the videotaping of one of the teaching assistants' regular classes. This tape is then reviewed with one of the program staff. The videotaping of classroom teaching has become a mainstay of the Campus Teaching Program.

Program Development

Formative, informal evaluation serving to guide development has been consciously interwoven with developmental activities from the start and will continue in the future.

Initial discussions with faculty members in many departments led to the conclusion that while there was no problem in identifying interested faculty and teaching assistants, their interest flagged when they were asked to consider a problem as a campus problem rather than a departmental one. Also, discussions with teaching assistants led us to conclude that their interests varied according to their disciplines and to the nature of the teaching responsibilities given to them. These considerations led to decisions to focus on the department as the unit most likely to be cohesive enough to achieve results, and to work with groups of TAs

in a number of different disciplines in an effort to understand the differences among departments (e.g., business as contrasted to social science departments).

The following points ought to be considered:

1. The identification of a need or a problem is a necessary but not sufficient condition leading to the development of an instructional activity.

2. The problem discerned must be recognized as a need by those people important to a successful resolution. In our case these were the teaching assistants, administrators, and faculty.

3. The developers of a new program are not merely casual observers who are among the many contributing their views to reach a consensus of need, but rather tend to be advocates of a particular position.

4. Advocates in the university setting have a limited range of options. They can use persuasion, demonstration, rewards, and in some instances, authority.

5. The developers are truly the persons in the middle. They act between the recipients of the activities and the people in the university hierarchy who must endorse the need for the activity. It is absolutely necessary to have credibility with both groups.

Our method of developing a program involved initiating informal discussions with faculty and teaching assistants and, finally, offering experimental seminars for teaching assistants. This served a number of purposes related to the above assumptions:

1. The primary purpose was to gain firsthand insight into the problem so that reasonable solutions could be put forward, after careful consideration and analysis. Certainly, insight is most easily gained by having extensive contact with the people who may be affected by your future actions. This is not a place where an armchair solution will suffice.

2. Talking to people about a problem is a good way to become visible as a person interested in that problem and to earn credibility as one who can be helpful in the solution. Building a network of acquaintances sympathetic to your point of view and priorities pays off when it is time to implement a program.

3. Providing information to people is a way to increase acceptance of the idea that there is a problem among those groups and in those departments where commitment may be weak. The stronger and broader the commitment to resolve a problem among groups on campus, the easier it will be to implement programs.

4. There are usually many acceptable ways to help alleviate a problem, and most will have their advocates somewhere on campus. For instance, we could have considered a lecture series on instruction offered in the evening or a set of open seminars for interested people during lunch. A formal course offered through the College of Education could have been organized or sensitivity group activities initiated. Instructional materials could have been developed for a computerized system of instruction, or videotapes produced for loan to interested groups. With so many options available, it was necessary to discover what were acceptable means of providing information about teaching to the teaching assistants.

5. Work in a variety of disciplines was necessary to explore the problem-solving approach of different disciplines and the educational language acceptable to each. Accountants and sociologists differ in the ways in which they approach problems and in the language with which they discuss them. Developers need to learn their language rather than teaching them the language of the educationist.

Keeping in mind the assumptions detailed above during our exploratory work with faculty and TAs, we eventually arrived at a set of convictions or beliefs. The following list is intended to be illustrative rather than exhaustive.

1. The amount of interest and effort a department devoted to the teaching of teaching assistants was often related to the dedication of a single faculty member in the department.

2. Departments differed markedly in the amount of responsibility given to teaching assistants, in their training, supervision, and evaluation, and in the importance placed on their teaching activity.

3. Departmental administrators and faculty developed enthusiasm in proportion to the degree they believed they were being helped with their problems.

4. Teaching assistants had a great deal of interest in learning how to improve their teaching.

5. Teaching assistants had little interest in learning the research, theories, and language of educators.

6. An education "methods" course was not valued by most disciplines.

7. The utility value of information about teaching was greatly enhanced if it was offered near the time of use. The more immediately practical the information, the greater the interest and acceptance of it.

8. Resources for a program of sufficient size to make a significant impact would come only after successful development and demonstration of a program.

Implementation

As the demand for the program grew among departments, additional staff members were employed. The content of the seminars became fairly well set, and the development of instructional materials to support and improve the process became a major activity. Monographs related to the topics of the various seminars were begun and three presently available are listed at the end of this article. Two demonstration videotapes have been completed, one on the subject of lecturing and one on questioning skills. It will take a number of years to meet the need for additional material to make the program most efficient and effective. The logistical problems related to moving videotape equipment into classrooms all over campus on a rigorous schedule and scheduling playbacks with dozens of teaching assistants have been met.

Program Impact

The program now operates on a scale that allows it to reach a significant percentage of new teaching assistants each year, and additional departments continue to seek involvement. As of this, the fourth year, no department that has adopted the program has withdrawn from it. The acceptance by the central administration, as well as by the departments, has been gratifying. It is probably safe to say that the program has been institutionalized on campus. As of the first semester of 1980, the program served about 25 departments, about 200 teaching assistants, and about 30 faculty.

There are other areas of growth as well. In the fall of 1980, a small advertisement was run in the student newspaper offering a program to teaching assistants who were not affiliated with departments already offering a program. Fifty-four teaching assistants and one faculty member representing 22 different departments attended an introductory session. Twenty of those attending elected to complete a series of 10 seminars and participate in the classroom videotaping activity.

Each year, with very little publicity, the number of faculty members taking part in the program has grown. In some cases, department chairpersons have let us know that a member of their faculty was having trouble in the classroom and asked for help. Of course, the implications of this kind of contact make work difficult, but we have managed to have some success. In other cases, faculty members, of their own volition, have asked for our assistance. One year we sent a letter to all new faculty members in one college on campus. With no other introduction than that, 25 percent of the group elected to participate in all or part of the program. In another college, a program involving a large number of faculty has been developed by one program staff member, with the assistance of an associate dean in the college.

The above are measures of acceptance at the grass roots level. The effect of the program on the allocation of resources is one way to judge acceptance at the administrative levels and is an easy one to quantify. The Campus Teaching Program was begun with one half-time graduate assistant as part of the Office's ongoing activities. By internal reallocation, we increased the number of assistants and the percentage of time they served in order to meet increasing demand. Two years ago, we received sufficient state money to fund three full-time positions. Last year we submitted a proposal to the University to more than double the size of the program. That proposal received strong support in competition with proposals from all three campuses of the University and is now awaiting action of the State Coordinating Board. A summative evaluation, "An Evaluation of the Campus Teaching Program," was completed in 1980 by visiting scholar Terence J. Crooks and is available from the Office of Instructional Resources. Reactions of departments and individuals who had participated over the two years 1978-1980 were collected, using questionnaires, in March and April, 1980. Questionnaires were sent to five subgroups of TAs and faculty and also to ten departments who had requested programs for some or all of their TAs.

The investigator concluded that the results of the evaluation clearly indicate that the program has generally been very successful. Most participants believe that they have gained in confidence and skill, and there is no obvious reason to distrust that belief. It should be noted that in most cases, participants were evaluating the program at least six months after their participation, and thus had had ample time to test and evaluate new ideas and skills. The cost of the program (about $58,000 in 1978-80) is modest in relation to the apparent benefits.

None of the nine departments participating in the evaluation indicated an intention to abandon or reduce the role of the program in their department, and two departments planned to expand the role of the program.

For additional information, contact Richard Smock, Course Development Division, Office of Instructional Resources, University of Illinois, 205 South Goodwin, Urbana, IL 61801. The following monographs are also available for $2.75 each:

"Improving Your Lecturing," by Nancy A. Diamond, Greg Sharp, and John C. Ory.

"Improving Your Test Questions," by John C. Ory.

"Assigning Course Grades," by David A. Frisbie, Nancy A. Diamond, and John C. Ory.

INTERDISCIPLINARY PROGRAMS AND COURSES

The Integrated Science Program

Northwestern University's Integrated Science Program (ISP) is now in its fifth year. This three-year honors program began with a grant from the National Science Foundation and continues with University support. Faculty and Student interest in the ISP remains high, and applications for the freshman class far exceed the thirty available positions in the program for entering students. Although the ISP allows students the option of graduating within three years, almost all students are choosing to remain for a fourth year at Northwestern. The fourth year gives these students more flexibility and breadth within the program. Specifically, it allows room for research experience at the undergraduate level.

A detailed description of the ISP curriculum was presented earlier in Development and Experiment in College Teaching, No. 13, p. 45, Spring, 1977. The program was designed to prepare students for graduate work in the basic sciences and applied mathematics. Students from the ISP have now gone on to Ph.D. programs in mathematics, physics, chemistry, biochemistry, molecular biology, and biology. To date, no students have chosen geology as a graduate field. Two students have entered joint M.D.-Ph.D. programs, one has gone to medical school for an M.D., one has matriculated for an M.B.A. degree, and one has entered a marine biology masters program.

It is too early to judge how well these students will do in graduate and professional schools, or in research, but results from summer jobs have been quite positive. Typically, ISP students involved in summer science-related jobs have returned extolling the value of their ISP training. It is hoped that some students will use their interdisciplinary knowledge in their research.

Although nearly all students in the ISP take the full mathematics and computer sequence of courses, not all entering students have completed the degree. About half have decided to emphasize either life or physical science, thereby dropping about one-third of the ISP courses and replacing them with courses for a major sequence. It is also possible to transfer to Northwestern's Technological Institute to complete an engineering degree.

Perhaps the most exciting development in the program is the growing use of ISP students as research assistants by Northwestern faculty. All students are encouraged to pursue research or independent study. Since most stay for four years, ample time is available. Each student's interests are assessed by the Director of the program, who then recommends faculty members who may have available positions for students in their research programs. Because the ISP students are so talented and well prepared, faculty members use them along with their regular graduate assistants.

INTERDISCIPLINARY PROGRAMS AND COURSES

Freshman Seminars at The University of Michigan

In 1978 The University of Michigan started the Freshman Seminar program, a series of seminars designed to give incoming students a challenging intellectual introduction to University academic life. Students are exposed to engaging subject matter taught by experienced members of the regular faculty, not teaching assistants and often professors emeriti. Classes are small, fifteen or less students, and active participation is encouraged.

The courses provide intellectually rigorous and disciplined reading and writing. The main objective of the seminars is to provide a sampling of pleasures and challenges of the University in a setting intended to counteract fears about the impersonality and size of the school. The sense of intellectual and social community engendered by a seminar should be one of its major benefits, as should any indirect counseling offered by a faculty member in the natural course of interacting with the students.

The seminars are offered under University course numbers and carry four credit hours each. They help to fulfill the University's distribution requirement, which requires concentrators in one subject area to elect courses in other disciplines. The courses vary each semester and provide instruction in many different areas of study. Courses currently being offered include: "The Enjoyment of Poetry," "Introduction to Japan," "Latin American Society and Literature," "Readers' Theatre," "Lives of Scientists," "The Year Two Thousand," "Black Holes, Quasars and the Universe," and "Topics in Mathematics."

For further information, contact Assistant Dean Jens Zorn, Literature, Science, and Arts Building, The University of Michigan, Ann Arbor, MI 48109.

INTERDISCIPLINARY PROGRAMS

The Rise and Fall of Course Mart

In 1972 in report number 8 of Development and Experiment in College Teaching, we described Course Mart, a highly successful curricular experiment at The University of Michigan. The program was created in 1968 in response to a demand for courses with content more "relevant" to the world beyond the campus, and it came to an end in 198 . Its significance within the curriculum over a decade's time makes it worthwhile to briefly consider how it developed and what brought about its demise.

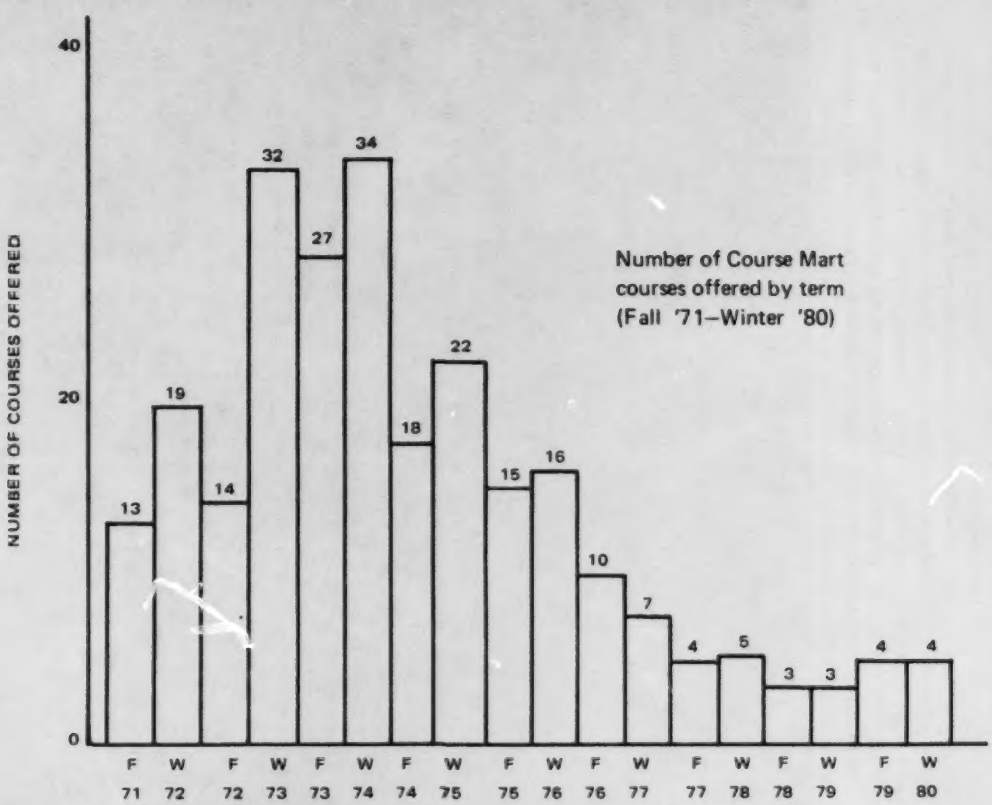
The idea for Course Mart was originated by the Student Government Council Curricular Reform Committee. The program was a changing "stock market" of credit courses for undergraduates in the College of Literature, Science, and the Arts (LSA). Proposals for courses were submitted by both students and faculty to a student and faculty committee which evaluated both content and teacher. If approved, a course also had to be accepted by the LSA Curriculum Committee.

Most courses did not fall within the traditional range of departmental offerings and credit was for a "College Course." Only a limited number of credits could be applied toward a degree, and courses did not fulfill distribution requirements. Innovative methods of teaching were often tried. Many offerings were on a pass-fail basis. Courses ranged in titles from "Major Theses in Science Fiction" to "Law and Social Change."

During the years of Course Mart's greatest success, the rapid expansion of offerings and enrollments made supervision and communication between the Planning Committee, sponsors, teachers, and students inadequate and incomplete. The usual departmental safeguards were not operating, and expansion made the maintenance of high quality courses more difficult. The apparent solution, a greater degree of regulation, was incompatible with the original intent of keeping Course Mart highly flexible. (See over, graphs show enrollment trends.)

As interest in Course Mart began to wane, fewer and fewer proposals were submitted, and of these, a greater proportion were unacceptable. At the same time, much of the subject matter was being incorporated into regular departmental offerings, often into "topics" courses. The Law School decided not to offer credit after fall, 1980, for undergraduate teaching by Law students; Course Mart courses taught by Law students had represented a significant portion of the total offerings. In light of this trend, the Course Mart program was reviewed by the LSA Curriculum Committee which concluded that Course Mart required a disproportionate amount of time and effort for the small addition the courses made to the LSA curriculum. The program was suspended as of the end of the 1980-81 academic year.

For more information, contact Nancy Bielby, Office of the Associate Dean for Curriculum, 2501 LSA Building, The University of Michigan, Ann Arbor, MI 48109.


NUMBER OF COURSES OFFERED
40
20
0
13
19
14
32
27
34
18
22
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7
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5
3
3
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4
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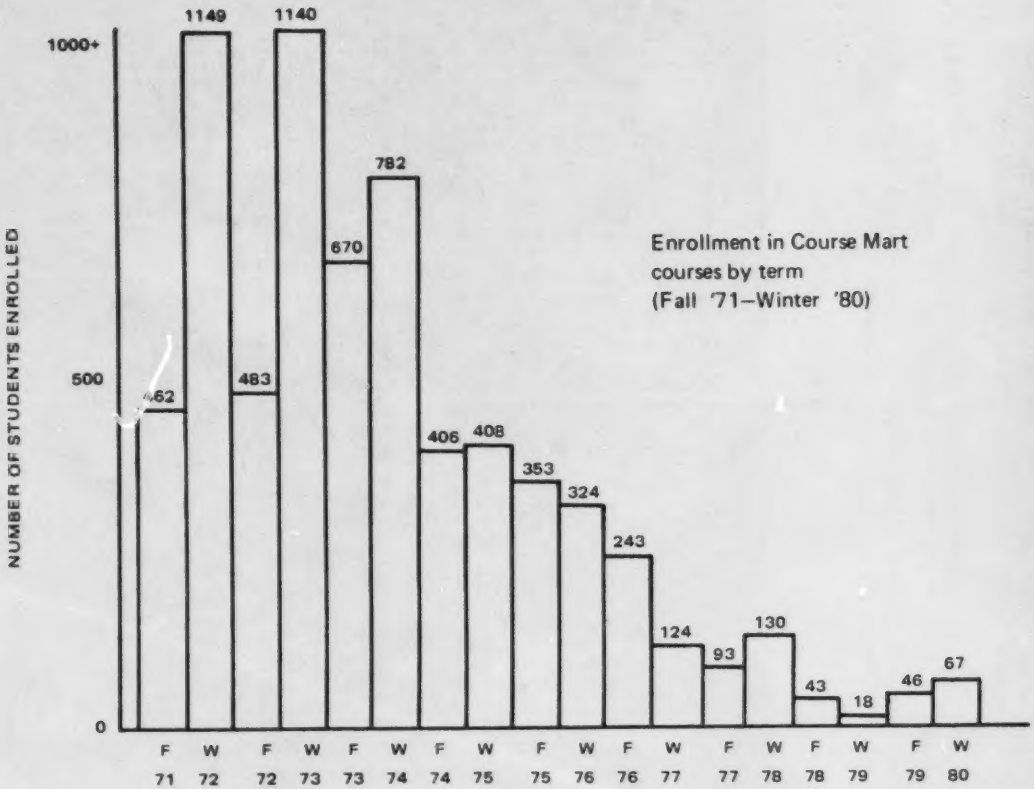
Number of Course Mart courses offered by term (Fall '71–Winter '80)



Enrollment in Course Mart courses by term
(Fall '71–Winter '80)

MEASUREMENT AND EVALUATION

Diagnosis of Instructional Outcomes

Beginning in 1978, an instructional improvement project in general chemistry was initiated to develop procedures in the use and analyses of pretests and posttests for the purposes of assessing and diagnosing instructional consequences. The goal was to develop a useful, and conveniently usable, approach to identifying, describing and, eventually, resolving the discrepancies between assessed consequences of instruction and desired outcomes. Rather than comparing instructional methods or treatments, the effort focused on describing the magnitude and nature of change realized for the basic topics in the course as a result of instruction.

On the second day of the course, a pretest was administered to all students; it was made up of items chosen from a larger pool of questions, prepared by a special committee of the American Chemical Society, representative of the basic topics in the course. At the end of the course a posttest was administered in which the items from the pretest were repeated and new items were added. Paraphrased and nonparaphrased (identical) versions of repeated items from the pretest to posttest were examined. Patterns of stability and change over the course appeared little affected by whether the items on the two tests were paraphrased or identical. Pretest to final exam patterns of consistency and change overall on each question, or on clusters of questions representing specific course topics, are then summarized in a five-category contingency matrix, e.g., for Pretest to Final overall:

	Final			
Pretest	c	e^s	e_d	ΣPretest
c	25.6	---	10.5	36.2
e	31.5	14.8	17.5	63.8
ΣFinal	57.1	14.8	28.0	

where: "c" = a correct response; "e" = an error; "e^s" = the same error on the final as on the pretest; and "e_d" = a different type of mistake on the final than that made on the pretest. (A FORTRAN IV program that runs on a CDC, CYPER 74 for conducting these analyses is available on request.)

Such analyses have been used to identify topical areas in need of improvement by providing estimates of "true gain" (e→c) achieved during instruction. Similar analyses have been done for courses in experimental psychology and evidence (in law) and have been started in art history. Other instructors, representing a wide range of subject matters and levels of instruction, are encouraged

to use the procedures and to share results to build extensive data bases from which "levels of gain" and patterns of stability and change may be compared and used as one basis for diagnosing areas of instruction which need improvement.

For further information, contact Professor Paul W. Fox, Department of Psychology and Consulting Group on Instructional Design, or Professor Archie S. Wilson, Department of Chemistry, University of Minnesota, Minneapolis, MN 55455.

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